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ABSTRACT

The term measurement has been used in a number of different sub-areas of psychology without an explicit recognition of the commonalities and potential differences in measurement characteristics. Analysis of these measurement situations reveals that the one common factor is that a mechanism or discriminative process, that is a standard system of measurement, is invariably used to identify magnitudes. A standard system is any mechanism or discriminative process that can indicate magnitude or differences between magnitudes. Three types of standard systems can be identified in psychology: the human, or elementary; the devised; and a dual process type. In addition, measurement situations may be differentiated in terms of different identifying characteristics or through differences in the way the standard system denotes the attribute being measured. Measurement may be identified in seven categories. Explicit identification of these categories of measurement in psychology and the elements of the measurement process allows for systematic comparison between the categories. They may be shown to differ to some extent in terms of denotability of the characteristic under consideration, the operating features of the standard system, the way in which metric or numerical information is derived, and the type of procedures used to evaluate measurement accuracy. (Author/PN)

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Types of Standard Systems and Categories of Measurement

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Abstract

The term measurement has been used in a number of different sub-areas of psychology without an explicit recognition of the commonalities and potential differences in measurement characteristics. Analysis of these measurement situations reveals that the one common factor is that a mechanism or discriminative process, that is a standard system of measurement, is invariably used to identify magnitudes. A standard system is any mechanism or discriminative process that can indicate magnitude or differences between magnitudes. Three types of standard systems can be identified in psychology; the human, or elementary, the devised and a dual process type. In addition measurement situations may be differentiated in terms of different identifying characteristics or through differences in the way the standard system denotes the attribute being measured. In all seven categories measurement may be identified. Explicit identification of these categories of measurement in psychology and the elements of the measurement process (Aftanas, 1984) allows for systematic comparison between the categories. They may be shown to differ to some extent in terms of denotability of the characteristic under consideration, the operating features of the standard system, the way in which metric or numerical information is derived, and, the type of procedures used to evaluate measurement accuracy.

Types of Standard Systems and Categories of Measurement

The term measurement has been used in a number of different sub-areas of psychology without the conscious identification of fundamental similarities or acknowledgement of the differentiating features of measurement peculiar to these areas. This paper will attempt to isolate the distinctly different areas of measurement in psychology, indicate the unifying measurement characteristic in all of these areas and point to the distinguishing characteristics that may be used to differentiate measurement concerns in these areas.

The term measurement or its variant has been used in psychophysics (e.g., Warren, 1981), personnel assessment (e.g. Landy, & Farr, 1980), behavioral research (e.g., Johnston & Pennypacker, 1980), behavioral assessment (e.g., Cone, 1977), ability and achievement testing (e.g., Allen & Yen, 1979; Popham, 1981), psychophysiological assessment (e.g., Johnson & Lubin, 1972) and self-report assessment of personality characteristics (e.g., Edwards, 1970) or attitudes and preferences (e.g., Dawes, 1972). These areas represent a diversity of approaches to the measurement of a variety of types of behaviors. An analysis of these in terms of the similarities and distinguishing features would be important to our understanding of measurement issues in psychology.

The Unifying Concept of Standard Systems

The concept of a standard system as the mechanism for denoting and indicating extent of magnitudes of attributes has

been introduced by Aftanas (1984) and refers to the mechanism of measurement. Conceptualizations of measurement invariably allude to the notion of such a mechanism of measurement even though a specific statement about the mechanism or its unique characteristics are not stipulated. Aftanas (1984) defined a standard system as "any device, mechanism or discriminative process that may be used to denote and indicate extent of magnitude or differences between magnitudes of a property" (p. 7). Measurement situations are similar, then, in that they all involve the utilization of a standard system of one kind or another as the mechanism of measurement.

The ultimate goal of measurement is to convert the information provided by the standard system into numerical information consistent with the appropriate characteristics of the number system. Numerical information indicating equality of units, for example, may only be derived when the standard system provides the basis for such information.

Types of Standard Systems

An analysis of the measurement literature suggests that three distinguishable types of standard systems can be differentiated (Aftanas, 1984). These have been identified as the human or elementary, the devised and dual-process standard systems.

The first of these, the elementary involves the use of the human capacity to distinguish between magnitude of attributes. The human acts as a basic standard system. In psychology as in other disciplines there are many attributes that can only be

denoted and measured in this way. The human observer may be instructed to determine magnitudes, and there are ways we can derive metric information from the basic information provided by the elementary standard system (e.g., Torgerson, 1958).

A second basic type of standard system is the type that is devised by psychologists to provide discriminations between magnitudes. These are the ability and achievement tests and the instruments that are constructed to denote and indicate magnitudes of attributes.

A third category consists of the self-report type of tests that are used to measure personality characteristics, attitudes, preferences and interests. It has been referred to as a dual-process standard system. This type of standard system has been differentiated from the devised because there are two processes operating in the estimation of the magnitude. The first is the estimation provided by the test and the second is the one required of the respondent; the person taking the test. When the test poses a question for the person he or she must go through a procedure of self-assessment in responding. The response either consists of a yes-no answer or a determination of the degree to which the item is descriptive of the person. Since there are two assessment processes operating there are in essence two different potential sources of variability in responses; one associated with the test and the second associated with the person.

Categories of Measurement

A second way in which measurement situations in psychology can be differentiated relates to the identifying characteristics

of the measurement situation or to the differentiations that may be made between the ways in which the standard system denotes the attribute. On the basis of these distinctions seven different categories of measurement may be identified. These seven categories are outlined in Figure 1.

Insert Figure 1 about here

Category 1: Elementary Assessment of Stimulus Magnitude

There are three different categories of measurement associated with the elementary (human) standard system. In the first category the focus of the elementary standard system is physical stimuli or human attributes that may be conceptualized as an attribute dimension. These latter characteristics are such human attributes as beauty or demeanor.

Category 2: Elementary Assessment of Overt Behaviors

The second category is identified as human assessment of observable and differentiable behavior. The human assessment of movements of various kinds such as smiles or nods, would be included in this category.

Category 3: Elementary Assessment of Latent Characteristics

In the third category the focus of the human standard system is latent characteristics that are inferred from the behavior of the person. When we make judgements about a person's anxiety or intelligence by drawing conclusions from observable behavior we are taking measurements of this kind.

Category 4: Devised Assessment Abilities and Achievement

Devised standard systems can be further differentiated into two categories of measurement. The fourth category of measurement involves the use of standard systems consisting of multiple items. The many ability and achievement tests are instances of this type of standard system.

Category 5: Devised Instrument Assessment of Interactive Behavior

The fifth category on the other hand involves the use of physical instruments of one kind or another to determine magnitudes. The standard system translates the behavior into some physical system that is then expressed in the units of the physical system. The many instruments used in psychophysiological research or in operant learning research are examples of this type of measurement.

The third type of standard system is the dual-process standard system. This measurement situation involves self-report assessment of personality and other attributes. There are two categories of measurement that can be differentiated.

Category 6: Dual Process Assessment of Personality

Category 6 includes self-report measurement of personality characteristics. In this category the respondents are generally asked to respond to a series of questions in terms of whether or not or to what degree the characteristic applies to them.

Category 7: Dual Process Assessment for Attitudes Interests and Preferences

The final category, the seventh, includes self-report tests of preferences, interests and attitudes. It is the same as

category 6 in that it involves the use of self-report measures. It may be differentiated from that category, however in that in this category rather than requiring an assessment of the extent to which a given characteristic applies, the respondent simply indicates the item with which she or he identifies. The respondent may be presented with several alternatives and be asked to indicate which is preferred.

The organizational scheme presented relates the different measurement situations to measurement theory through the introduction of the concept of a standard system and highlights the distinctly unique aspects of the different measurement situations that exist in psychology.

It may be shown that the categories of measurement identified differ to some extent with regard to:

1. denotability of the characteristic under consideration;
2. the operating features of the standard system;
3. the way in which metric or numerical information is derived; and,
4. the procedures involved in the evaluation of measurement accuracy.

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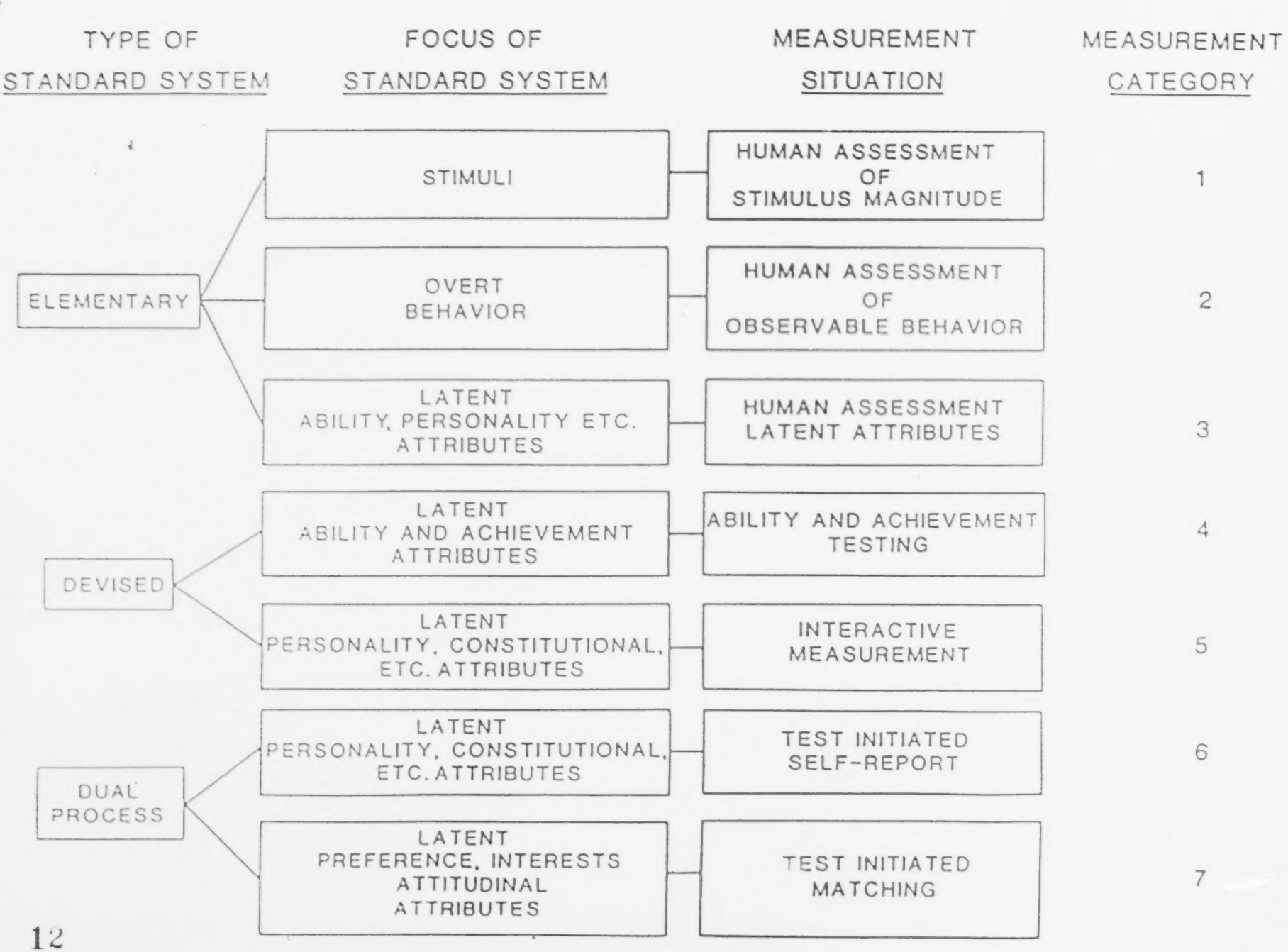
TYPE OF STANDARD SYSTEM
FOCUS OF STANDARD SYSTEM
MEASUREMENT SITUATION
MEASUREMENT CATEGORY
ELEMENTARY
DEVISED
DUAL PROCESS
STIMULI
HUMAN ASSESSMENT OF STIMULUS MAGNITUDE
1
OVERT BEHAVIOR
HUMAN ASSESSMENT OF OBSERVABLE BEHAVIOR
2
LATENT ABILITY, PERSONALITY ETC. ATTRIBUTES
HUMAN ASSESSMENT LATENT ATTRIBUTES
3
LATENT ABILITY AND ACHIEVEMENT ATTRIBUTES
ABILITY AND ACHIEVEMENT TESTING
4
LATENT PERSONALITY, CONSTITUTIONAL, ETC. ATTRIBUTES
INTERACTIVE MEASUREMENT
5
LATENT PERSONALITY, CONSTITUTIONAL, ETC. ATTRIBUTES
TEST INITIATED SELF-REPORT
6
LATENT PREFERENCE, INTERESTS ATTITUDINAL ATTRIBUTES
TEST INITIATED MATCHING
7

Figure Caption

Figure 1. Standard systems and measurement situations in Psychology.